

BWSC's Clean Energy Results Program

Clean Energy/Climate Adaptation Updates

Waste Site Cleanup Advisory Committee Meeting
Thursday, March 24, 2016

Thomas M. Potter
Clean Energy Development Coordinator



AGENDA

1. 2015 MA Clean Energy Industry Report
2. Renewable Energy Development on
3. Greener Cleanups Leadership Recognition
4. Climate Change Adaptation



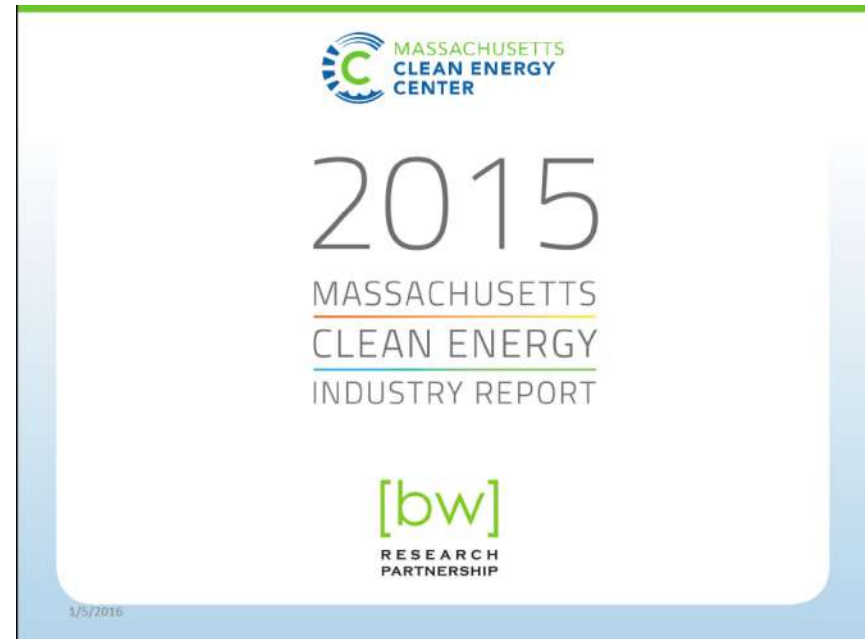
Shaffer Landfill, Billerica

Massachusetts Clean Energy Industry Report

2014



2015



<http://www.masscec.com/2015-massachusetts-clean-energy-industry-report>

About MassCEC

- **Created by legislation – the Green Jobs Act of 2008 ([Chapter 23J of the General Laws](#))to:**
 - **Create** jobs, long-term economic growth
 - **Cultivate** a robust marketplace for innovation
 - **Accelerate** technology development
 - **Support** affordable and appropriately-sited municipal, residential and commercial projects
 - **Invest** in clean energy infrastructure
- Funding from the Renewable Energy Trust Fund - systems benefit charge paid by electric ratepayers of investor-owned utilities in Massachusetts and participating municipal electric departments.

The Clean Energy Industry

2014



Massachusetts Clean Energy Industry is Significant

\$10 Billion Industry
2.5% of Gross State Product

88,372 jobs

2.4% of total Massachusetts workforce

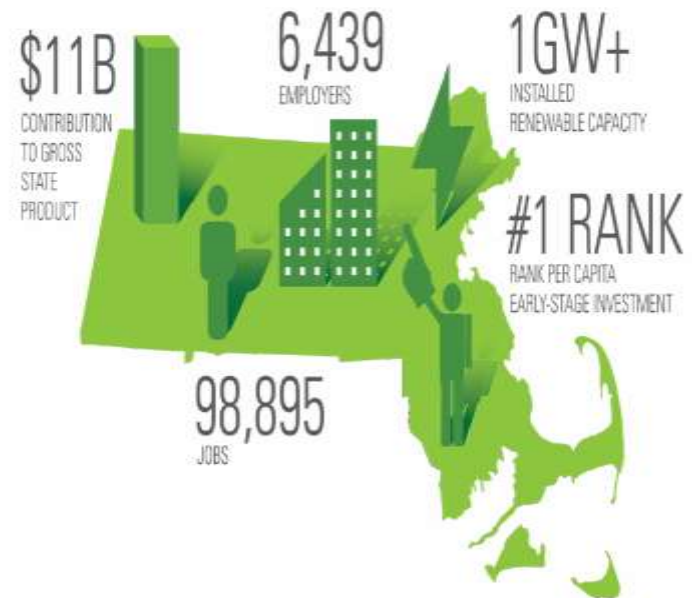
5,985 firms

2.7% of total Massachusetts companies

2015



Massachusetts by the Numbers



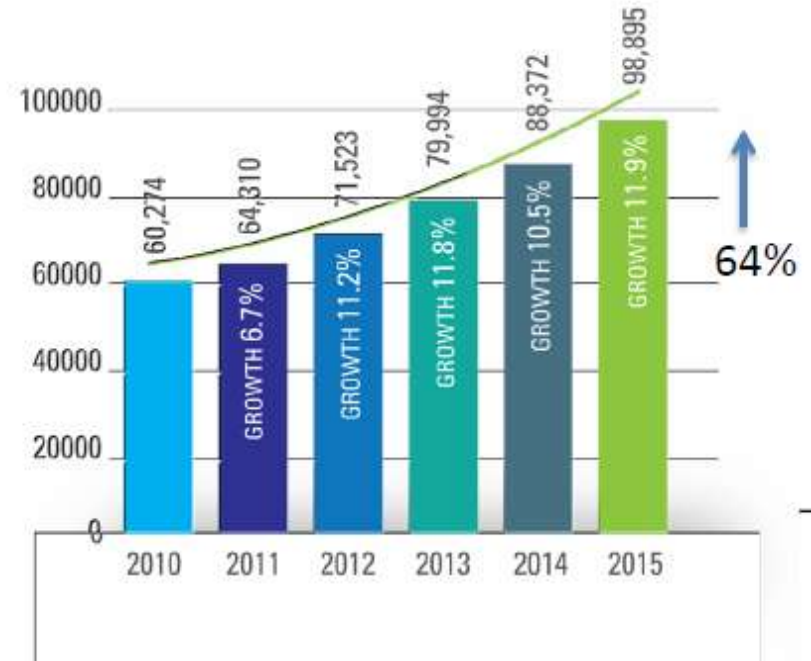
Job Growth

2014

2015



Strong Historic Growth

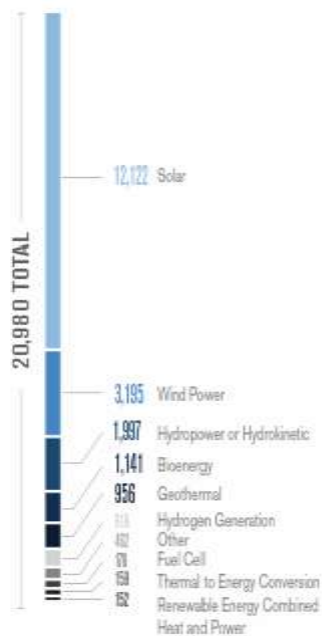


Renewable Energy Jobs

2014



More than Half Renewable Energy Jobs are in Solar



2015

TABLE 8: RENEWABLE ELECTRICITY GENERATION ESTABLISHMENT, BY SUB-TECHNOLOGIES

SUB-TECHNOLOGY	2015
Solar (PV or Photovoltaic)	14,820
Wind Power	2,618
All Other	6,220



Strengths and Barriers

Reported Advantages to Operating in Massachusetts



Educated customer base, green culture, high demand	26.0%
Thriving clean energy business environment, good network, high growth/profits	26.0%
Consumer incentives (utility support, state support, etc.)	19.2%
Legislative support	18.3%
Talent, education	16.0%

Barriers to Company Growth



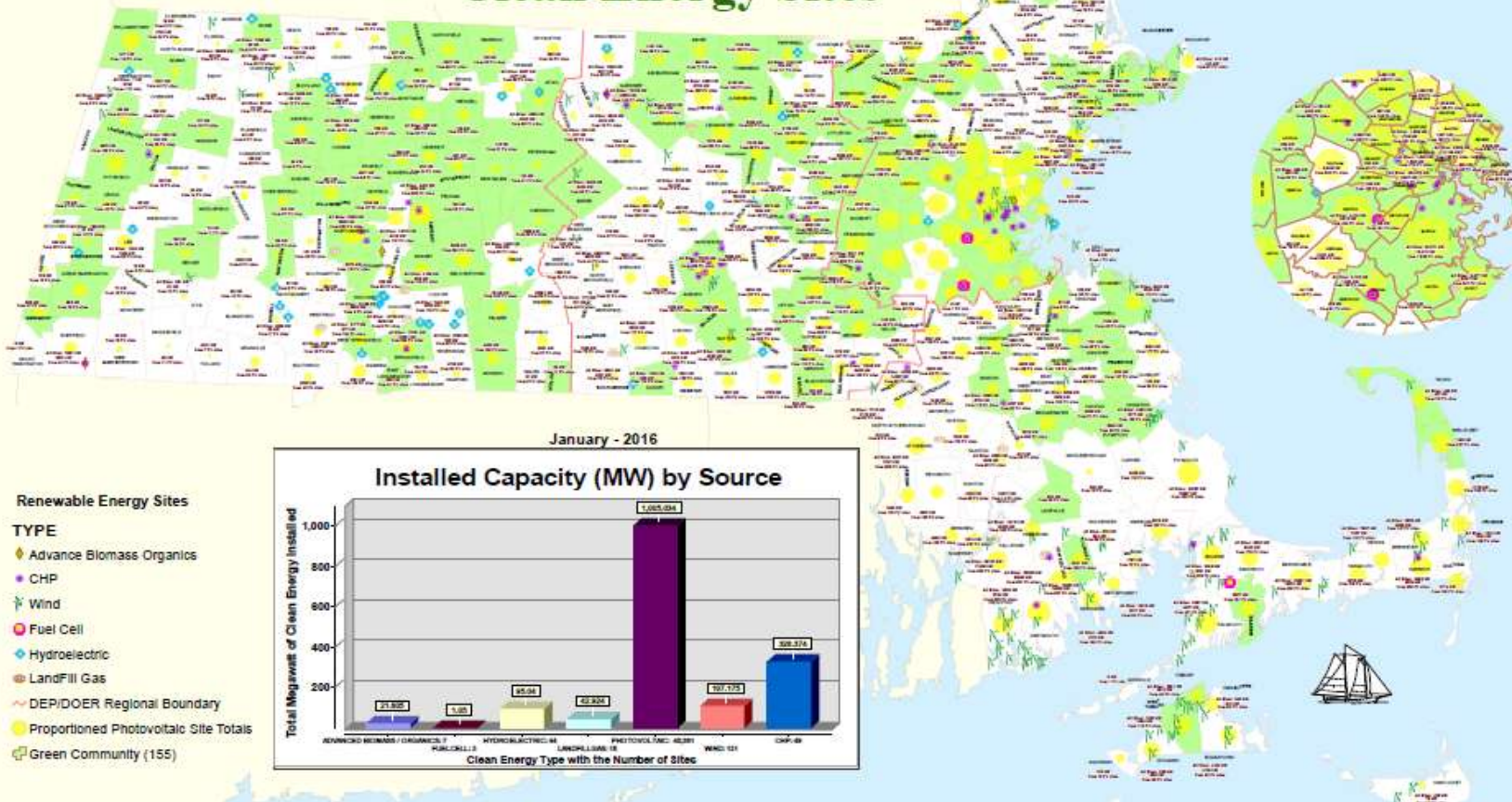
Working with utilities	30.8%
Access to skilled labor	25.3%
Identifying first customers/early adopters	25.3%

1/5/2016



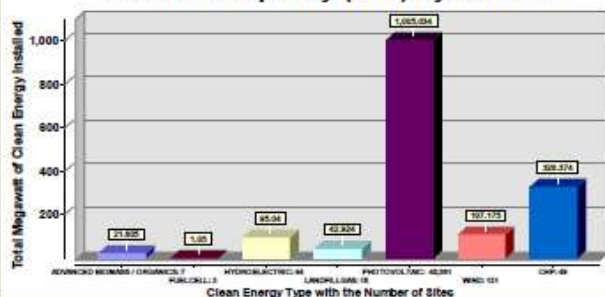
Massachusetts Green Communities and Clean Energy Sites

CLEANENERGYRESULTS
Advancing renewable energy & energy efficiency in the Commonwealth



January - 2016

Installed Capacity (MW) by Source



Renewable Energy Sites

TYPE

- ◆ Advance Biomass Organics
- CHP
- ✈ Wind
- Fuel Cell
- ◆ Hydroelectric
- Landfill Gas
- ~ DEP/DOER Regional Boundary
- Proportioned Photovoltaic Site Totals
- ☐ Green Community (155)



Commonwealth of Massachusetts
Governor
Karyn E. Polito
Lieutenant Governor
Matthew A. Boston
Secretary of Energy
and Environmental Affairs



MassDEP
Department of Environmental Protection

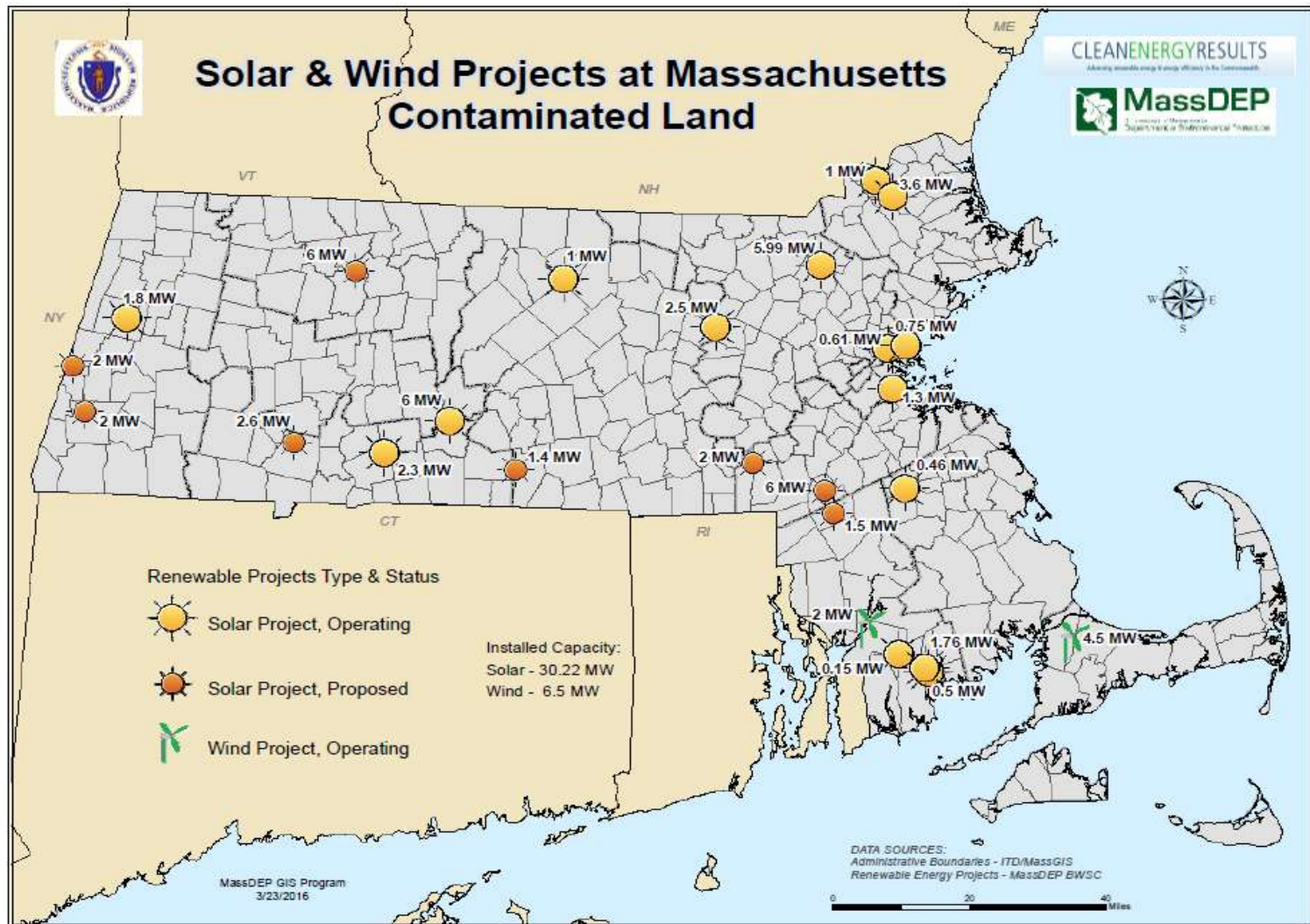


**MASSACHUSETTS
CLEAN ENERGY
CENTER**

0 10 20 40 Miles

Map data: OpenStreetMap contributors, Imagery: Google, Mapbox, etc.

What's happening with Solar PV Development on Contaminated Land/Brownfield Sites?



Contaminated Land/Brownfield PV

- **25 Total Projects (59 MWs)**
 - **17 projects (36 MW)** are now operating. (yellow)
 - **8 projects (23 MWs)** have DOER “Brownfield Pre-Determination” letters and are seeking financing and interconnection permits (orange)



<http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/contaminated-land-and-brownfields/>

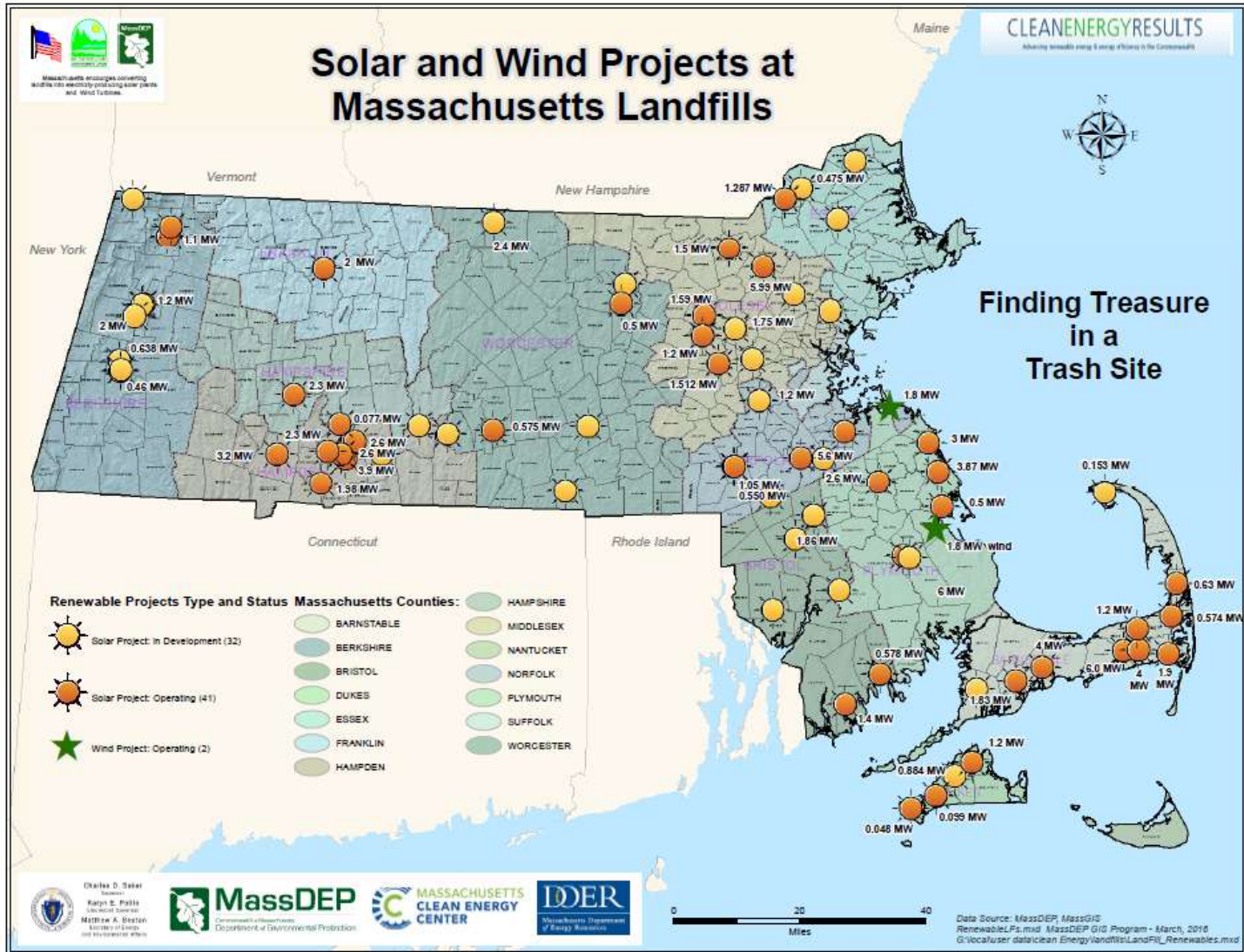
Case Study – Palmer Airport

- **6 MW on 35 Acres**
- Town of Palmer (a Green Community) property tax revenue approximately \$2 million over the 20 year project term.
- Town of Leicester, Town of Spencer, and Worcester State University, will purchase net metering credits resulting in millions of dollars in energy savings for these entities over the 20 year term.
- Land owner, and PRP will benefit from the long-term ground lease.



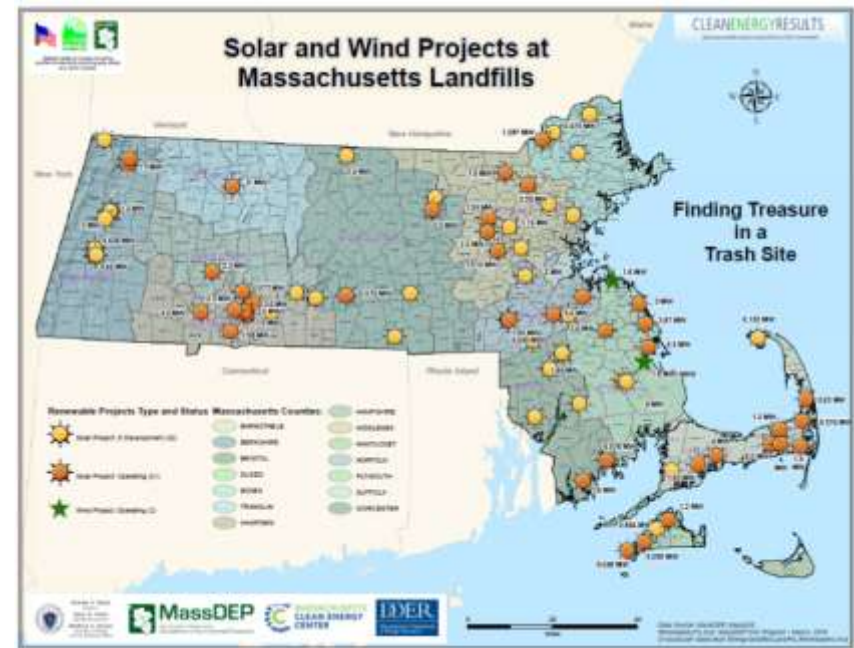
Press Release: <http://www.remenergyco.com/wp-content/uploads/2016/02/Palmer-Airfield-Press-Release.pdf>

What's happening with Solar PV Development on Landfill Sites?



Landfill PV

- **74 Total Projects (144 MWs)**
 - **44 projects (86 MW)** are now operating. (**orange**)
 - **30 projects (58 MWs)** have MassDEP Post-Closure Use Permits for renewable energy and are seeking financing and interconnection permits (**yellow**)



<http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/landfills/>

RE-Powering America's Land Initiative: Project Tracking Matrix (October 2015)

https://www.epa.gov/sites/production/files/2015-03/documents/tracking_matrix.pdf

INSTALLATIONS BY STATE OR TERRITORY ²						
State	# Installations	Installed Capacity (MW)	State Renewable Portfolio Standard ³	Solar Set-Aside Policy ⁴	Solar Multiplier Policy ⁵	Distributed Generation Requirement ⁶
MA	52	111.9	✓	✓		
NJ	14	69.5	✓	✓		
CA	12	104.9	✓			
NY	9	71.0	✓			✓
CO	7	6.5	✓		✓	✓
OH	6	11.7	✓	✓		
PA	6	178.5	✓	✓		
WY	5	295.8				
TN	4	10.1				
AZ	3	20.0	✓		✓	✓
TX	3	11.6	✓		✓ ⁷	
MD	3	4.5	✓	✓		
IL	2	10.9	✓	✓		✓
NM	2	3.0	✓	✓		✓
VT	3	5.2	✓			✓
DE	2	0.7	✓	✓		
NC	2	0.6	✓	✓		
OK	2	0.0	✓ ⁸			
WI	2	0.6	✓			
OR	1	100.00	✓	✓	✓	✓ ⁹
RoUS ¹⁰	18	52.2				
TOTAL	158	1,070				

Keeping the Momentum Going

FEDERAL Incentives

- **Investment Tax Credit**
 - December 2015 spending bill included an extension of the ITC for solar photovoltaic's and other renewables.
 - The existing 30% solar ITC (set to expire on 12/31/16) is now active through December 31, 2019, after which the credit will be stepped down to 26% and 22% in 2020 and 2021, respectively.

STATE Incentives

- **Net Metering**
- **RPS Solar Carve-out Renewable Energy Certificates (SREC)**

Net Metering CAP

Statute:

- 4% cap on “private” projects (proposed 2% increase)
- 5% cap on “public” projects (proposed 2% increase)
- Caps are based on the distribution company’s peak demand
- Small net metering systems are exempt from the net metering caps (e.g. Residential ≤ 25 kW DC)
- The System of Assurance allows an entity to reserve the ability to net meter in the future
- First net metering “queue” in the nation
- See www.MassACA.org for more information

Date: 3/3/2016									
Private and Public, All Utilities (Values in kW-AC)									
			Capacity (kW)						
Net Metering Cap			999,942						
Interconnected			601,218						
Reserved Cap Allocations			235,765						
Pending Cap Allocations			32,351						
Capacity Available under the Cap			130,608						
Private: Available, Interconnected, Reserved and Pending Capacity (Values in kW)									
	Company	Net Metering Cap	Interconnected (a)	Reserved Cap Allocations (b)	Pending Cap Allocations (c)	Capacity Available Under Cap (e)	Waiting List (d)		
	NGrid	205,240	129,193	73,679	1,153	1,215	121,689		
	NStar	199,120	98,632	54,470	14,497	31,521	0		
	WMECO	34,160	14,208	3,780	3,502	12,671	0		
	Unitil	4,080	3,325	745	0	10	369		
	NGrid-Nantucket	1,819	0	24	29	1,765	0		
	Total	444,419	245,358	132,698	19,180	47,183	122,059		
Public: Available, Interconnected, Reserved and Pending Capacity (Values in kW)									
	Company	Net Metering Cap	Interconnected (a)	Reserved Cap Allocations (b)	Pending Cap Allocations (c)	Capacity Available Under Cap (e)	Waiting List (d)		
	NGrid	256,550	205,386	47,974	3,119	71	65,686		
	NStar	248,900	127,871	41,347	8,352	71,330	0		
	WMECO	42,700	19,456	13,746	1,700	7,797	0		
	Unitil	5,100	3,047	0	0	2,053	0		
	NGrid-Nantucket	2,274	100	0	0	2,174	0		
	Total	555,524	355,860	103,067	13,171	83,426	65,686		

RPS Solar Carve-out Renewable Energy Certificates (SREC)

SREC I (2009)

- Program cap of **400 MW**
- No restrictions on growth. Land-use issues in some communities – particularly with regard to use of agricultural lands, open space, and forestland
- **400 MW Cap met in 2013!**

SREC II (2014)

- Program cap of **1600 MW** (1200 additional) minus the capacity reached in SREC I.
- Financial incentives differentiated between Market Sectors
- **Favorability to Landfill and Brownfield type projects**
- **1,200 MW additional Cap met on February 5, 2016. (660.595 + 854 MW applications = 1,514.5)**
- **120 MW reserved for projects equal to or less than 25kW DC.**
- **SREC III – 2017!!**

Greener Cleanup Leadership Recognition Program

Recognition

“MassDEP will recognize ***the person(s), entity, or project*** that demonstrates exemplary professional judgment regarding the promotion, development, evaluation and implementation of activities intended to reduce the net environmental footprint of site assessment and remediation conducted in accordance with the MCP.”

ELIGIBILITY

- Any response action submittal completed in accordance with applicable requirements of the Massachusetts Contingency Plan (MCP) in consideration of the “Greener Cleanup” elements prescribed at 310 CMR 40.0191 and, as applicable, at 310 CMR 40.0858.
- FY2016 recognition: Response action submittals **filed between June 30, 2014 and June 30, 2016.**



MASSDEP REVIEW AND CONSIDERATION

- Primary focus will be on MCP regulatory compliance and observance of the five core elements of “Greener Cleanups (refer to MassDEP BWSC’s “Greener Cleanups Guidance”, WSC-14-150 at <http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/site-cleanup-policies-guidance.html>).
- Identification, prioritization, selection, implementation and documentation of feasible ASTM’s Best Management Practices (BMPs), and/or other technical equivalent.



SUBMISSION FOR SELECTION

- Self-identifying Application Process:
 - Submission: Email
Thomas.Potter@state.ma.us
and/or
Susan.Fessenden@state.ma.us
 - Include: Release Tracking Number (RTN), submittal type/name, submittal date
- **DUE: June 30th 2016**



Case Study A - BMP Table Summary

Assigned Priority	Category	BMP Description	Implementation of BMP
High	Building	Reuse existing structures for treatment system, storage, sample management, etc.	Rather than construct a separate SVU equipment staging shed, all SVU equipment is housed within or attached to the existing building. This reduces the need for materials and labor since all equipment is located closer to the extraction points in the building.
High	Materials	Implement a flexible network of piping (under and/or above ground) which allows for future modular increases or decreases in the extraction or injection rates and treatment modifications.	2-inch PVC manifold pipe was run under the floor to the nearest wall or partition, where it was extended above the drop ceiling to the SVU blower. This configuration would allow modifications to the manifold system with little effort and materials. PVC unions at the blower allow for quick and easy remove should motor repairs be necessary.
High	Materials	Maximize the reuse of existing wells for sampling, injections or extractions where appropriate and/or design wells for future reuse.	The SVU extraction wells will serve to actively extract VOC vapors when the SVU system is active and will serve as a soil gas monitoring points once the SVUS has achieved its

Assigned Priority	Category	BMP Description	Implementation of BMP
			objectives. At the completion of the project, the Vapor-pin soil gas probes will be removed and reused on other projects.
High	Materials	Prepare, store and distribute documents electronically using an environmental information management system.	Correspondence and reports prepared by LSI are transmitted to the LSP or record electronically for a virtually paperless project. All MassDEP submissions are also paperless through e-IMP.
High	Power & Fuel	Use pulsed rather than continuous injections when delivering or extracting air to increase energy efficiency when nearing asymptotic conditions.	The SVU system is configured with an electrical timer that will allow for pulsed operation of the SVU system. Considering that little VOC mass remains at this site and is primarily in the vapor phase, VOC removal will become diffusion limited shortly after start up. Therefore, the SVU system will be adjusted to operate for about 12 hours per day.
High	Power & Fuel	When nearing asymptotic conditions and/or when continuous pumping is not needed to contain the plume or reach clean-up objectives, operate pumping equipment in pulsed mode.	See above.
High	Proj. Planning/ Team Mgmt.	Use local staff (including subcontractors) when possible to minimize resource consumption.	Project will use owner's staff to construct portions of the SVU system. Other contractors are from a 50-mile radius of the Site.
Medium	Sampling & analysis	Use local laboratory to minimize impacts from transportation.	LSI will use a North Providence based laboratory for analysis of all environmental media except the air analysis which will be delivered to a Mansfield, MA laboratory by courier.

Case Study B - BMP Table Summary

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Tools Sign Comment

BEST MANAGEMENT PRACTICES (BMPs) CONSIDERED FOR GREENER CLEANUPS UNDER THE MCP AT 310 CMR 40.095B(4)(C)

Category	Best Management Practice	Core Elements Addressed (at Site Level)					Remediation Technology											
		Design	NO	Water	Materials and Waste	Land and Environment	Soil Vapor Detection	Soil Sampling	Pump and Treat	In-situ Chemical Oxidation	Bioremediation/MNA	In-situ Thermal Treatment	Phytoremediation	Subsurface Characterization & Treatment Systems	Excavation and Surface Remediation	On-Site Remedial Operations	Transportation Management	
Site Characterization																		
Materials	Submission or use phosphate-free detergents or biodegradable cleaning products instead of organic solvents or acids to decontaminate sampling equipment			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Materials	Use dedicated materials (that is, reuse of sampling equipment and reuse of disposable materials/equipment) when performing multiple rounds of sampling				X		X	X	X	X	X	X	X	X	X	X	X	X
Sampling and Analysis	Use local laboratory to minimize impacts from transportation	X	X				X	X	X	X	X	X	X	X	X	X	X	X
Sampling and Analysis	Use passive/active purge groundwater sampling system			X	X			X	X	X	X	X	X	X				
Remedial design, implementation, operation, and maintenance																		
Materials	Prepare, store, and distribute documents electronically using an environmental information management system				X		X	X	X	X	X	X	X	X	X	X	X	X
Project Planning and Team Management	Use local staff (including subcontractors) when possible to minimize resource consumption	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
Soil Management and Site Development																		
Materials	Use on-site/local materials, when possible (for example, used waste for compost, rocks for drainage control)	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
Site Preparation/Land Restoration	Minimize soil compaction and land disturbance during site activities by restricting traffic to certified operators and protecting ground surfaces with biodegradable covers, where applicable			X		X	X	X	X	X	X	X	X	X	X	X	X	X
Site Preparation/Land Restoration	Use on-site or nearby sources of backfill material for excavated areas, if shown to be free of contaminants	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X

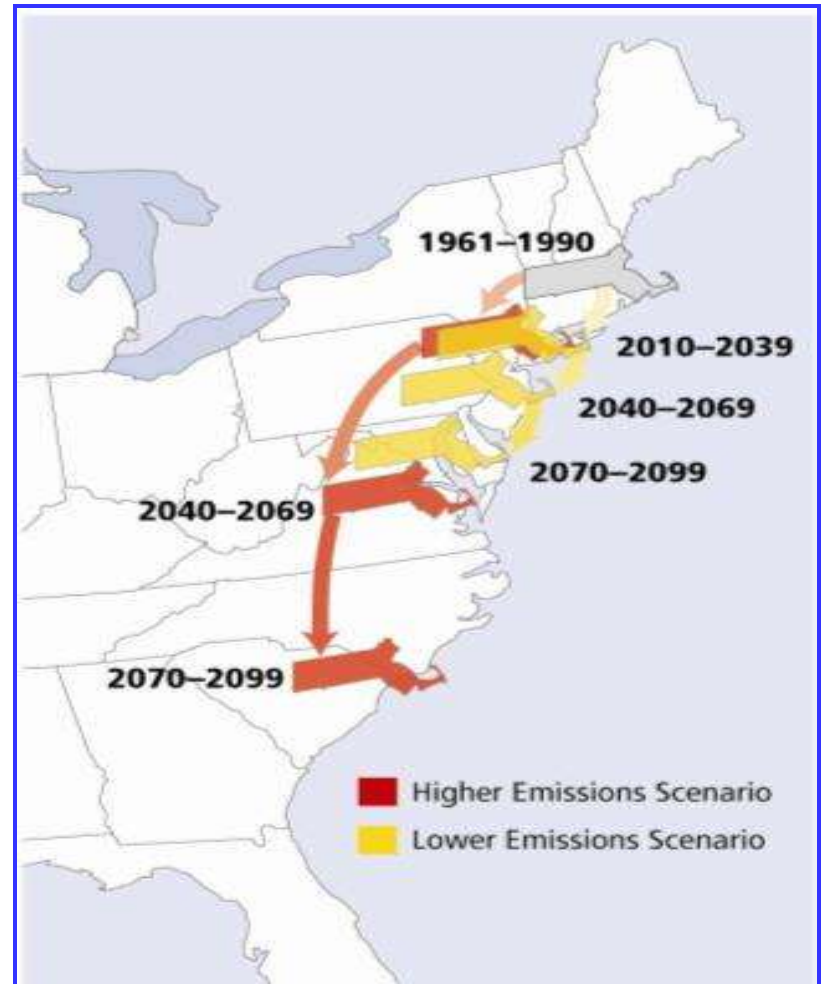
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Greener Cleanups Updates

- ***PURSUIT* of LEED Credit**
 - USEPA Region 1
- ***REVISED* ASTM Standard Guide**
 - April 1, 2016
 - Adjunct BMP Table
- ***UPCOMING* GC Workgroup Meeting – June 7th**
 - Presentation: Josh Kessler, MassCEC
- ***PROPOSED* AEHS Conference – October 2016**
 - Quantitative Evaluation
 - Green & Sustainable Cleanups
 - Site Sustainable Reuse

Climate Change



Source: NECIA/UCS, 2007 (see: www.climatechoices.org/ne/)

2008 Global Warming Solutions Act

MITIGATION

- Reduce greenhouse gas emissions below 1990 levels by 10-25% by 2020 and 80% reduction by 2050
- “Clean Energy and Climate Plan for 2020” (the 2020 Plan)

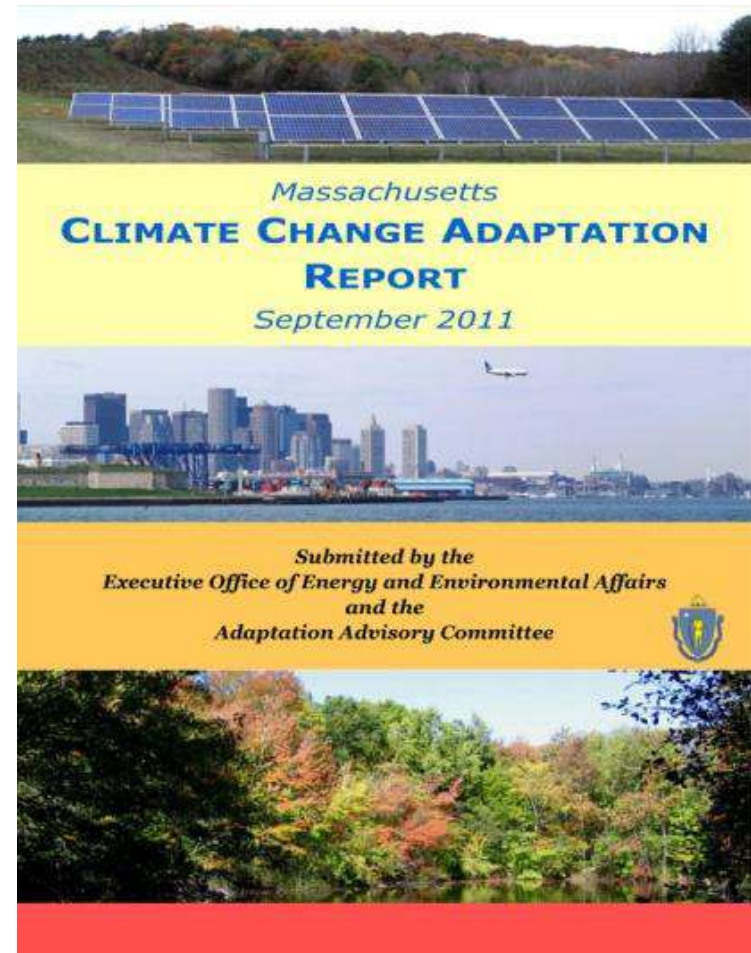
ADAPTATION

- Convene a committee and prepare a report to Legislature to: “analyze strategies for adapting to the predicted impacts of climate change in the Commonwealth”
- MA Climate Change Adaptation Report issued in 2011

2011 Climate Change Adaptation Report

Impacts & Vulnerabilities

- **Sea Level Rise and Flooding**
 - Coastal inundation and storm surges
 - Property damage and loss of natural habitats
 - Interruption of key services
- **Extreme Weather**
 - High winds, hurricanes, storm surges, waves, ice storms, flooding
 - Reduced emergency response capacity
- **Precipitation**
 - Decreased summer, increased winter precipitation
 - Less spring snow melt and earlier peak streamflow
 - Current 100-year flood every 2-3 years by 2100
 - Extended low-flow periods, decreased summer water supply
- **Temperature**
 - Higher temps, more extreme heat



2008 Global Warming Solutions Act

Mitigation - **DONE!**

- Through **Greener Cleanup practices**, we seek to reduce GHG emissions of assessment and remediation of OHM sites to **mitigate** climate change (among other goals)

Adaptation – **TO DO!**

- Through **adaptation**, we seek to ensure OHM site **remedy resilience** in the face of climate change impacts

MA Activities Related to Adaptation

- **Executive Office of Energy and Environmental Affairs**
 - Dam/Seawall Loan and Grant Program
 - Draft MA Environmental Policy Act Adaptation Policy
 - National Disaster Resilience Competition
- **Department of Environmental Protection**
 - “Circuit Rider” for water/wastewater utilities
 - *Addressing BWSC’s universe of OHM sites for climate change impacts and vulnerabilities*
- **Coastal Zone Management**
 - Storm Smart Coasts Program for municipalities
 - Green Infrastructure Grants
 - Coastal Resiliency Grants
- **Department of Energy Resources**
 - \$25M protect against energy service interruptions
 - Regulatory changes to encourage investment in system hardening, new communication, innovative technologies

U.S. Environmental Protection Agency

- ◆ The *USEPA Policy Statement on Climate-Change Adaptation* (2011) directed each national program office and region to develop a climate change adaptation implementation plan by June 2013
- ◆ Executive Order 13653 (2013) directed each federal agency to evaluate climate change risks and vulnerabilities to manage the effects of climate change on the agency's mission and operations in both the short and long-term
- ◆ In June 2014 EPA released the final EPA Climate Adaption Report

Source: USEPA, 4/5/15

EPA Superfund Analysis

- ◆ Goal: Climate change vulnerability analysis across our most common remedies (portfolio analysis)
 - Developed matrix of remedy sensitivity to climate change
 - Rated relative vulnerability of individual remedies to climate change scenarios
- ◆ Screened frequent and potentially vulnerable remedies
 - GIS plot of remedies based on site lat-long coordinates
 - Focus on subset of higher vulnerability and frequent remedies

Focus on Pump and Treat and containment remedies at sites due to high infrastructure costs, presence of physical plant, long operating life and high number of remedies. Containment remedies have remaining contaminants that could be mobilized.

Source: USEPA, 4/1/15

Remedy Vulnerability to Climate Change

Common Remedy Types*	Climate Change Scenarios							
	Flooding (Event)	Inundation (Chronic)	Extreme Storms	Large Snowfall	Wild Fires	Drought	Extreme Heat	Landslide (Precip)
Source In Situ								
SVE								
Solidification/Stabilization*								
In Situ Thermal Treatment								
Multi-phase Extraction								
Bioremediation								
Source Ex Situ								
Solidification/Stabilization*								
Physical Separation								
Recycling								
Surface Water Treatment								
Unspecified Off Site Treatment								
On-site Containment								
Groundwater In Situ								
Bioremediation								
Chemical Treatment								
Air Sparging								
Permeable Reactive Barrier								
Groundwater Ex Situ								
P&T								
Vertical Engineered Barrier								
Monitored Natural Attenuation								

Qualitative Vulnerability Analysis

* Most common remedy types based on Superfund Remedy Report

- No known potential impacts
- Minor impacts: Potential for temporary loss of remedy functionality or effectiveness, contaminant(s) remain contained
- Moderate impacts: Potential for total loss of remedy functionality and effectiveness indefinitely, contaminant(s) remain contained
- Major impacts: Potential for total loss of remedy functionality and effectiveness indefinitely, contaminant(s) release

Source: USEPA, 4/1/15

Boston University Climate Change Adaptation Project

- Research and understanding of available authoritative resources (e.g. MassDEP, USEPA & FEMA)
- Identification and screening of BWSC's universe of OHM sites for climate change impacts and vulnerabilities
- Focus on Flooding of remedial sites (e.g. PHV, ROS)
- **Plotting sites near or within 100 & 500 year floodplains** per Regional Office
- Review of site files and available resources for recommendations on adaptation measures.



Plotting Sites near or within 100 & 500 year floodplains (source: USEPA, 4/1/15)

Climate Change Resources

MassDEP

- <http://www.mass.gov/eea/agencies/massdep/climate-energy/climate/>

USEPA Superfund

- <http://www.epa.gov/superfund/superfund-climate-change-adaptation>
 - Climate Change Adaptation Technical Fact Sheet: Groundwater Remediation Systems <https://semspub.epa.gov/work/11/175851.pdf>

Thank You!

Thomas M. Potter

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Clean Energy Results Program Website:

<http://www.mass.gov/eea/agencies/massdep/climate-energy/>